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MAY 15, 1987
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OEM EDITION

Everything You Want to Know About Big Systems

☐ During the past 12 months have you canceled or delayed any mainframe system order(s)? ☐ In what year did your organization first install a mainframe system? ☐ If already installed, who is your pcm cpu supplier? ☐ Are you using a DBMS software package on your IBM or pcm cpu mainframe system(s)? ☐ What average-per-year rate do you expect IBM's price per MIPS to decline over the next 3 to 5 years?

PLUS:
FOUR RULES OF DDP

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TRAINING TODAY'S END USER

DATAMATION

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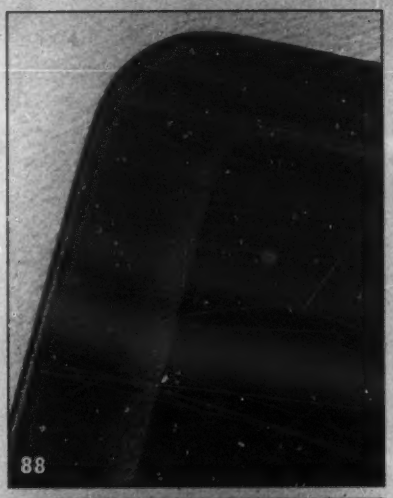
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Cover illustration by Kerry Gavin

OEM EDITION
MAY 15, 1987
VOLUME 33
NUMBER 10
THIS ISSUE, 191,927

1987 JESSE H. NEAL AWARD

Editorial

Not Unlike Non-Negatives

Rumblings of an industry rebound are not unexpected. Where did these rumors of cautious optimism originate? Why, from reports of lessened pessimism, of course.

Take IBM's first-quarter earnings, for instance. The facts are these: IBM posted a 23% decline in first-quarter profit to $785 million from the $1.02 billion of the comparable quarter a year ago; the decline would have been worse had IBM not had the benefit of favorable currency translations and a lower tax rate. The earnings drop would have been greater still were it not for strong mainframe and PC sales in March; these results prompted IBM chairman John F. Akers to comment that "there are some encouraging signs in our business"—the most positive (or least negative?) note from him in over a year.

Now for the interpretations. The town criers shouted out not a 23% decline in earnings, but rather a less-than-expected decline. Add Akers' "encouraging" remark, and the not-as-bad-as-predicted decline became an improvement-over-expectations, which was simplified to a tale of improvement.

"We are not unencouraged . . . " began some accounts of IBM's earnings decline. "The negative attitude toward an industry turnaround is abating," read others. Surely by now you are not unaware of the pattern.

In the wake of IBM's splashy announcement of almost 100 PC-related products, we have not gone wanting for analysis. "We are not unimpressed . . . " with the depth and breadth of this product line, say industry analysts. The new products are "certain to stem further losses in market share for Big Blue," say others. The Personal System/2 "will not foster significant short-term discontinuity" for the pc industry and its players, others speculate.

Be not uncareful as you read John W. Verity's report on results of the annual DATAMATION/Cowen & Co. mainframe survey (p. 69), which tells of "continued deceleration in dp budgets." Our lead News In Perspective stories reported by Susan Kerr, Gary McWilliams, and Edith D. Myers (beginning p. 21), which show computer users "not unconcerned" about some aspects of IBM's Personal System/2 announcements, should not go unnoticed. Most important, be not unaware of the possibility of double negatives resulting in a nonpositive.

(None of which is to say an industry rebound is not unlikely.) ■

REBECCA S. BARNA
EDITOR

BIG SYSTEMS

Mainframe Users Survey: Tough Times for IBM

Decelerating dp budgets signal gray skies for the industry leader, but pcms may clean up, the 10th DATAMATION/Cowen mainframe survey shows.

BY JOHN W. VERITY

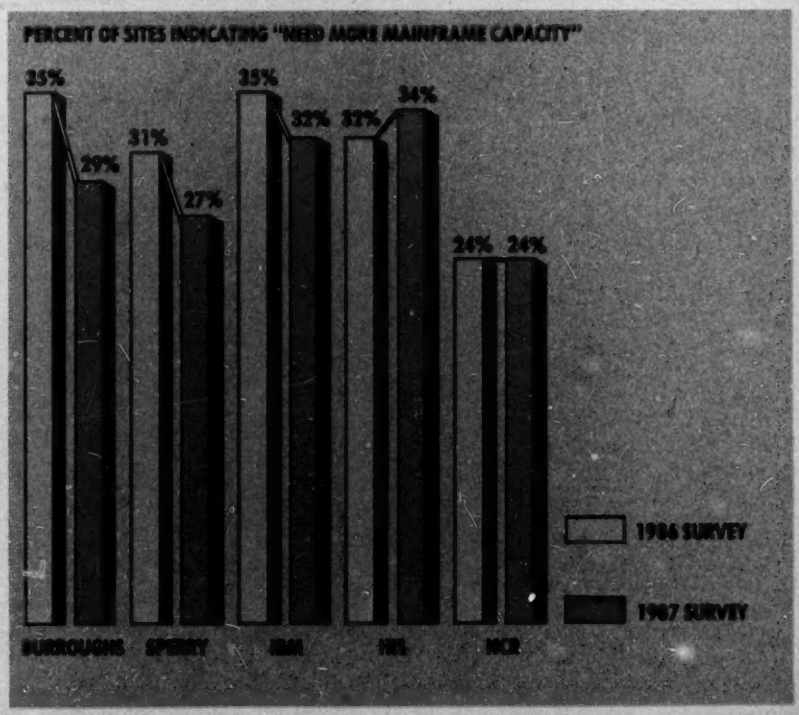
Despite upgrades for its 3090 mainframes and the beginning of shipments of its new midrange 9370s, IBM will find it hard this year to show substantial growth in its domestic mainframe revenue stream. Data processing hardware budgets are declining due to general economic sluggishness; installed mainframes possess an increasing excess capacity; and makers of plug-compatible gear seem to be retaking market share from the besieged giant.

A large sample of IBM computer sites in the U.S. and North America indicated in March that in the months to come, through December 1988, they planned to install equipment worth 31% of the value of their installed mainframe gear. That is not a shabby number, but a similar sampling taken a year earlier showed plans to acquire equipment worth 34% of the installed base. Thus, with the added negative factor of demand that is less than overwhelming for its new line of Personal System/2 microcomputers (measured before it was formally introduced), IBM this year may be hard-pressed to regain its traditional pace of double-digit growth. Improvements will come primarily from internal cost-cutting and repricing of products.

These are among the major findings of the 1987 Computer and Telecommunications Survey conducted by DATAMATION and Cowen & Co., Boston. The survey, which polled mainframe users as to their installed equipment and near-term spending plans (see "Survey Method"), also revealed the following trends:

- Peaking product cycles bode well for fairly strong shipment growth at the non-IBM mainframers, namely Honeywell, Unisys (Burroughs/Sperry), and NCR. However, those firms face increasing competition from IBM and Digital Equipment Corp. in the important areas of distributed processing and office systems.
- Pcm companies Amdahl Corp., Sunnyvale, Calif., and National Advanced Systems, Santa Clara, seem particularly well positioned to gain market share from IBM in the mainframe cpu and disk markets, where their products are beginning to ship in high volumes with competitive prices and features. Amdahl enjoys great customer loyalty on the strength of its multiple domain feature, which permits several disparate operating systems to run concurrently on a single cpu without all the overhead incurred by IBM's VM software hypervisor. Meanwhile, Storage Technology Corp. appears to be regaining lost ground in the disk drive market.
- IBM's 9370 midrange 370 processor, although accepted fairly well by users, may not produce as much incremental business for Big Blue as some may hope. Although some 60% of the 9370 systems planned for installation will replace no previously installed systems, where replacement is involved the machine appears to be capturing many applications once destined for other IBM systems. More than half of the applications intended for the "VAX killer" were originally intended for other IBM machines.
- IBM Credit Corp. (ICC) is an increasingly important factor in users' acquisition plans. It is involved in 19% of users' planned 3090 acquisitions, up from 12% a year earlier. ICC is also shown as capturing about 11% of projected 9370 installations for 1987-88 while third-party lessors gain 44% of that business.
- Growth in each and every area of the dp budget (cpu/peripherals, pcs, teleprocessing equipment, software packages, and salaries) is decelerating. Dp budgets that were expected to grow 9.7% in 1985 and 8.2% in 1986 are projected to grow only 5.7% this year. IBM hardware budgets were projected to increase only 7.8% in the coming three to five years, down from the more robust 8.6% seen in last year's survey.
- On-line transaction processing now accounts for over a quarter of all the pro-

FIGURE 1 Less Need For Mainframe Capacity



cessing done on IBM mainframes—27% this year, compared with 20% the year before. Its substantial growth (up from 17% in the 1983 survey) comes at the expense of batch and timesharing.

- The Unix operating system, although gaining considerable acceptance for workstations and departmental systems, has yet to gain much attention from mainframe users. Some 70% of the survey's respondents said they had no desire for the AT&T-developed software.
- Corporations indicated remarkably low interest in IBM's new personal computer line, as yet unannounced at the time of the survey. Asked how likely it was that they would "broadly replace" installed IBM PCs with the new machines, only 3.1% said it was "very likely." Meanwhile, users indicated increasing acceptance of PC clones during the past year.

IBM's mainframe business is now largely concentrated on the 3090 mainframe. That machine has been shipping for less than two years and yet in terms of dollar value it comprises more than a third (36%) of the IBM installed base sampled by the survey this year.

With IBM's shipping of the 3090 in high gear, Amdahl and National Advanced Systems have seen their combined North American installed cpu market share decline for the fourth year in a row. Amdahl's share as of February was just below 7% while NAS came in at just over 2%. This combined share of 9% is down substantially from the more than 15% recorded in 1983's survey.

IBM's competitors will likely regain some share in the months ahead, however, with Amdahl likely to be the biggest winner. Survey respondents indicated that for 308X/3090-class equipment to be acquired in the following 24 months, they would spend 14% of their money with pcms (2% for NAS and 12% for Amdahl). Those numbers are up sharply from the 4% total in last year's poll. Amdahl will further enjoy the fact that as users switch to its 5890 systems from the 580 series, the average price per planned Amdahl system is rising to $3.6 million in this year's survey from $1.7 million in 1986.

Asked about their attitude toward pcm vendors and their systems, respondents were decidedly upbeat this year. Some 23% of the large-scale IBM-compatible sites (up from 19% a year earlier) said they had a pcm system installed, on order, or had plans to order, and 15% (up from 14% last year) said they were con-

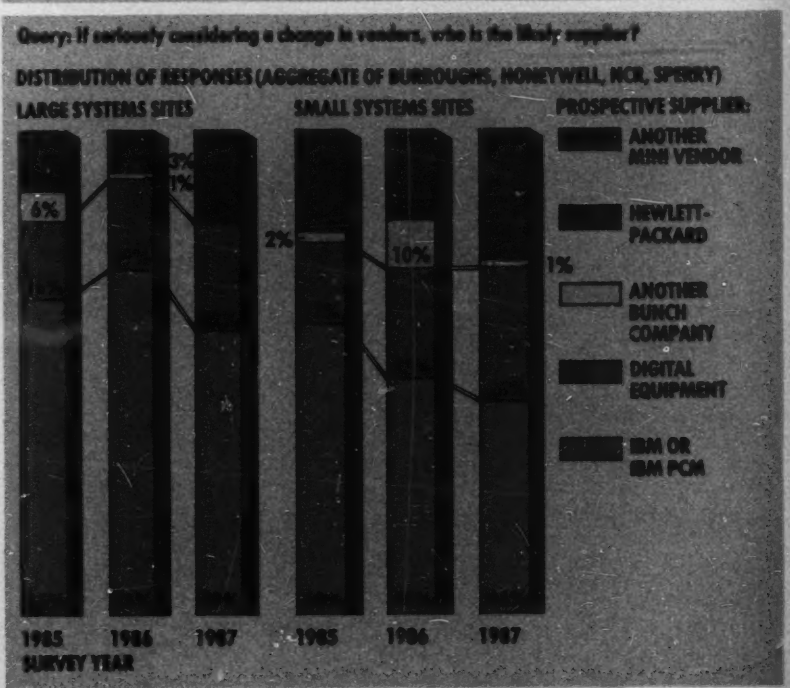
FIGURE 2 BUNCH Users Want More Application Software

Query: Which category of service needs the most attention by your vendor?

INDUSTRY SERVED	MOST FREQUENTLY CITED CATEGORY(S)			
	HONEYWELL	SPERRY	BURROUGHS	NCR
MANUFACTURING	Applications Software	Applications Software	Applications Software	Applications Software
WHOLESALE/ RETAIL	DB/DC Software Field Maintenance Operating System	Applications Software	Applications Software	Sales Personnel Applications Software
FINANCIAL INSTITUTIONS	Applications Software	Applications Software	Applications Software	Applications Software
SERVICE BUREAUS	Applications Software	Applications Software	Applications Software	Systems Price/ Performance
EDUCATION	Applications Software	Sales Personnel	Systems Engineering Support	Applications Software
GOVERNMENT	Applications Software	Applications Software	Applications Software	Applications Software
DEPARTMENT OF DEFENSE	Applications Software	Operating System	Field Maintenance	Systems Engineering Support

FIGURE 3 BUNCH Users Lean to IBM and DEC

Query: If seriously considering a change in vendors, who is the likely supplier?



sidering installing one. Among current Amdahl and NAS sites, only 12% of the former (down from 22% in 1985) and 5% of the latter (down from 24%) said they would go back to IBM when it came time to replace their present cpu.

In fact, respondents' attitudes toward IBM as a supplier took a sharp negative turn this year: while 23% of the sites in 1985 said they looked on the company more favorably compared with the year before, this year's poll found only 13% in that category. Similarly, 11% said in 1985 that their attitude was less favorable, but this year 21% held that view.

As noted above, Amdahl has pleased users greatly with its multiple domain feature, something IBM does not supply. Of those sites with the feature in use, 90% said they would stick with Amdahl for their next large-scale Amdahl cpu upgrade; among Amdahl sites without the feature in use or planned for 1987-88, 43% said they would switch back to IBM. Luckily for Amdahl, the share of its users with the multioperating system feature installed is projected to rise to 55% by the end of next year, from 24% now.

IBM Slipping in Drives Category

Planned installations of peripherals for IBM users were found to be up only slightly from the year before. About 44% of the respondents planned to add disk drives (up from about 41% the year before), 20% planning additional tape drives (up from 19% last year), and 41% planning additional terminals, up from 40%.

In disk drives, a prime contributor to IBM's bottom line, the industry leader's position seems to be slipping a bit. IBM's share of the installed base looks stronger than in its share of planned acquisitions for the upcoming 24 months, as plug-compatible manufacturers boost shipments of their 3380-type products. IBM controls 79% of the mainframe disk drives that respondents have installed (including 3380s and smaller drives), but it stands to gain only 74% of their future orders.

Big Blue's loss appears to be largely StorageTek's gain: the Louisville, Colo.-based company's share of all installed drives was measured at 7%, but the company will get 10% of the future disk drive orders. NAS, too, will enjoy an increase, to 4% of the upcoming orders, up from 3% of the installed base. Amdahl and Memorex, however, will show a decline,

FIGURE 4 Users Want Faster 3090 Channels

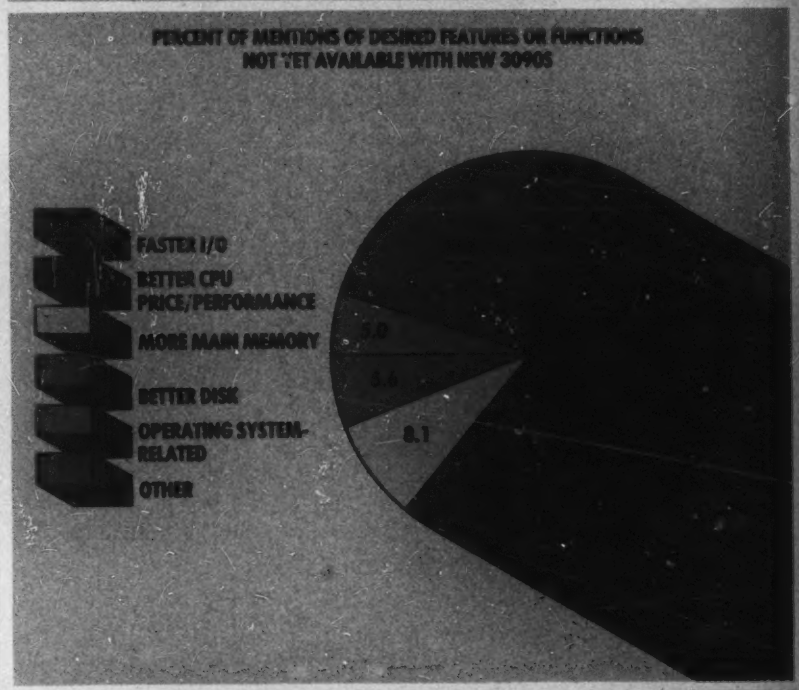
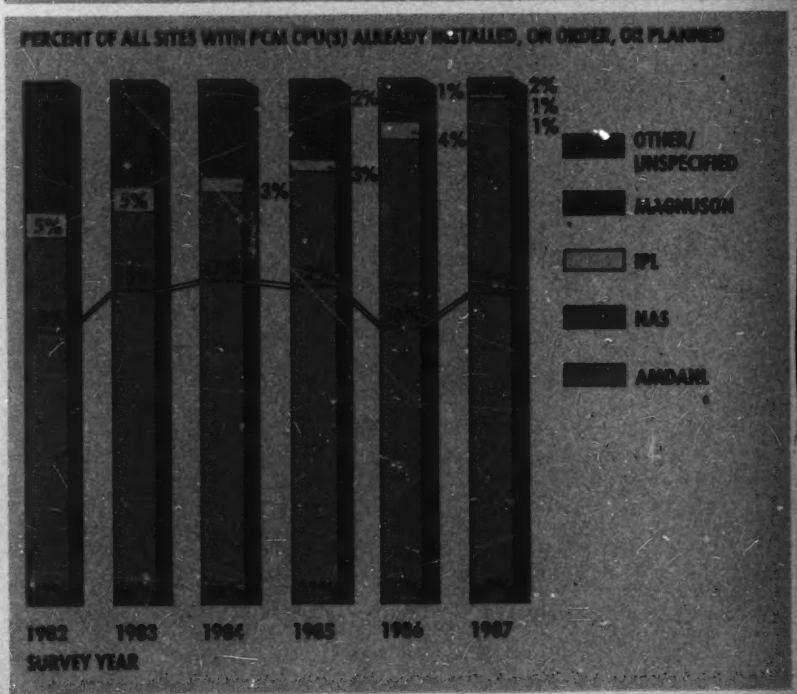


FIGURE 5 Amdahl Gains Pcm Market Share



to 2% and 1%, respectively, from 4% and 3%.

IBM's share of the 3380 market appears to be dropping significantly, even though respondents said they would acquire more 3380E double-capacity models than single-capacity drives. While last year they said they would get 86% of their 3380 units from IBM during the following 24 months, this year the comparable figure is only 77%. StorageTek's comparable 3380 share rose to 9% this year, from 5% last year. (In the non-3380 disk arena, where IBM's share of planned procurements is holding firm at around 63%, StorageTek will grow to 17% of planned shipments this year, from only 11% a year ago.)

The survey showed a diminished need for disk capacity among IBM and compatible sites. While 72% of the large-scale (308X/3090) sites last year said they needed more capacity, this year's figure was only 65%. Among 4300-class sites, the 1986 and 1987 figures were 55.7% and 54.4%, respectively. System/3X sites, however, showed a slight increase, to 43.9% this year from 42% in 1986.

IBM's share of the tape drive market, buoyed by its 3480 model, continues to rise. Last year, respondents said they'd get 65% of their tape drives from Big Blue; this year, that number is up to 73%. StorageTek, too, will enjoy an increase, to 16% this year from 14% in 1986.

In the crt terminals area, IBM remains dominant, with 67% of planned procurements, up from 59% a year earlier. ITT-Courier and Telex's comparable shares each seem to be dropping to 8% this year, down from 10% in 1986. In contrast, Memorex is enjoying a slight increase to 7% this year, from 5% in 1986.

While IBM had seemed to lose share in the DBMS market in previous surveys, its DB2 package is now coming on like gangbusters. At the time of the survey, IBM sites of all sizes indicated that 5% of their installed DBMS packages were SQL, 6% were DB2, 11% were DL/1, and 17% were IMS. As for planned installations, however, the comparable figures were 15%, 29%, 2%, and 4%, respectively. Among large-scale sites, DB2's share is even more impressive: a whopping 59% of planned installations, up from 10% currently installed.

Needless to say, IBM's rebound in the DBMS market is squeezing independents severely. Cullinet, for instance, garnered 16% of the current installations

FIGURE 6 IBM Slips in Large Disk Share

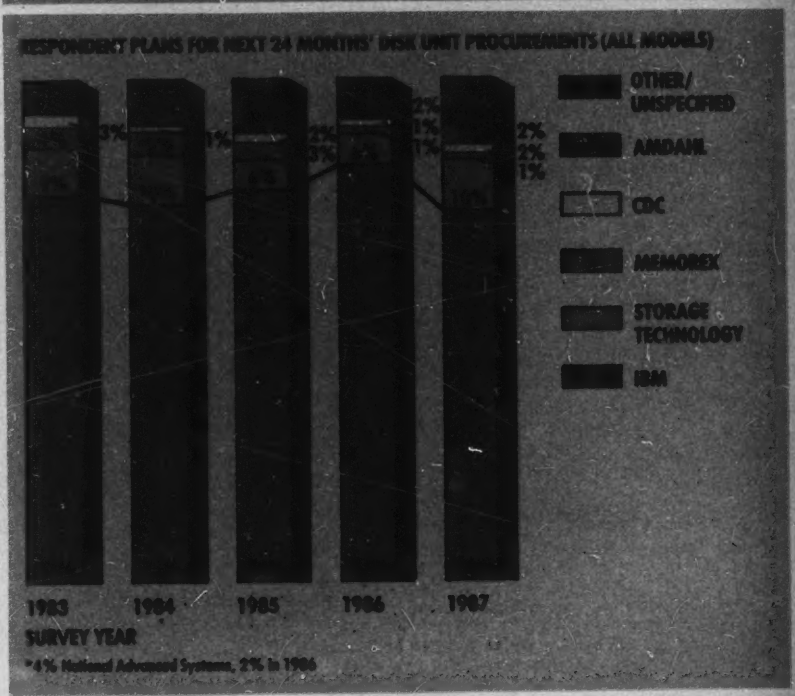
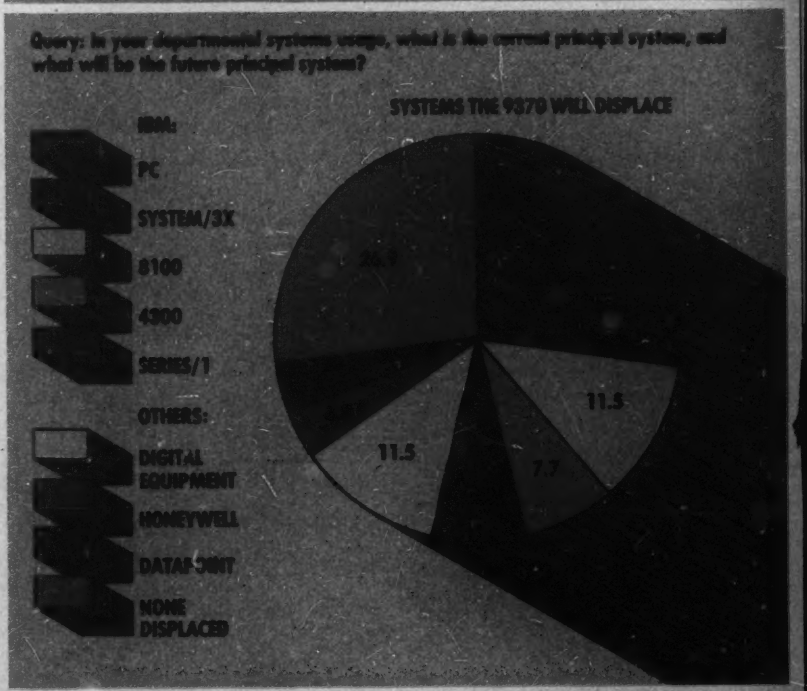


FIGURE 7 9370 to Affect IBM Systems More Than Others



but stands to get only 9% of the future buys. Among large sites, Cullinet's share will fall to 6% planned from 18% installed.

But IBM is only holding the line in the 4300-class sites, where even though SQL is moving to 24% planned from 10% installed, the company's total share remains at 41%. Cullinet will drop to 10% planned from 16% installed; Software AG to 8% planned from 9% installed. Applied Data Research, however, will improve slightly, to 12% planned from 10% installed.

Attitude on Burroughs Improves

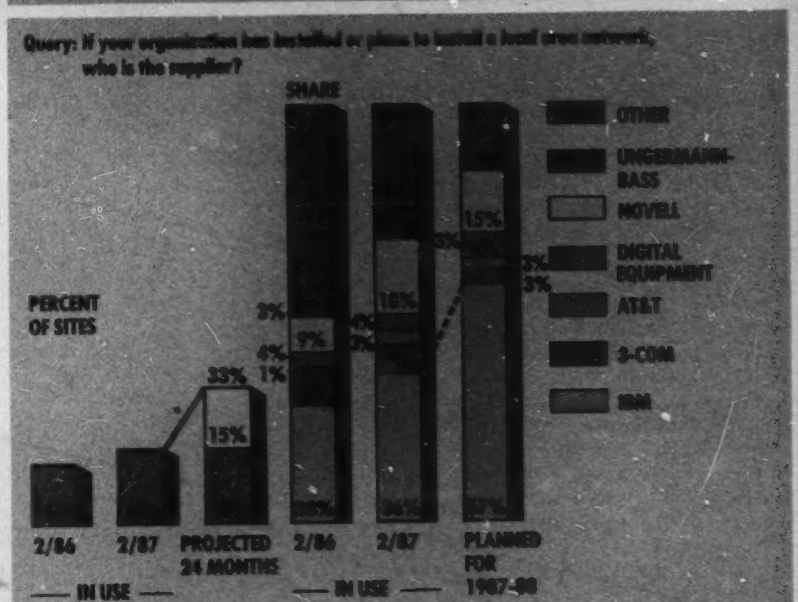
Perhaps the biggest event in 1986 for the computer industry was the creation of Unisys Corp., through Burroughs' acquisition of Sperry. Naturally, the big question is how well Unisys can manage its two constituencies' disparate, and possibly conflicting, needs. In general, users of Burroughs gear viewed the merger as affecting their buying decisions quite positively, but high-end Sperry 1100 sites saw it having a negative effect. Given that Sperry initially resisted Burroughs' acquisition move, this latter reaction may simply be an emotional one. There is little sign of potential defections among those disgruntled 1100 sites, even though delivery of compatible follow-on systems may be stretched out.

As with the other non-IBM-compatible suppliers, both Burroughs and Sperry users said that the area needing most attention from their respective vendor was applications software. However, overall ratings improved from the year before, more for Burroughs than for Sperry sites.

Unisys respondents said they planned to install equipment in 1987-88 that will be worth 25% of the value of their current installed base. That compares favorably with the 20% figure derived from last year's survey. For Burroughs sites alone, the comparable figure was 31% extra value to be added, up from 23% a year before; for Sperry sites, it was 20% this year, compared with 17% before.

The need for additional mainframe capacity among Burroughs sites was down this year to 29% of the sites, from 35% last year. Among Sperry sites, the comparable figures were 27% this year compared with 31% last year. A need for extra disk capacity was indicated by 39% of the Burroughs sites, down from 44% in the 1986 survey, and by 45% of the Sperry sites, down from 50%.

FIGURE 8 Novell Gains with IBM in LAN Market



*35% compound user base expansion (down from 44% in 1986 survey)

**Includes Sytek (5% 2/86, 2% 2/87), Corvus/Omninet (4%, 2%), Wangnet (3%, 2%), Network Systems Hyperchannel (2%, 2%), Xerox (3%, 1%), etc.

The Burroughs sites showing the most demand for extra mainframe capacity were not those among its commercial breadwinners—manufacturing, wholesale/retail, and financial institutions—but rather the education and civilian government sectors. Among Sperry sites, the strongest demand is to be found in national defense and communications utility sites.

Add-on peripherals activity plans among Unisys sites was found to be flat or down compared with those of last year. Only slight increases were found in terminals, while the important disk business was down sharply in both camps. The percentage of respondents buying from Unisys is up, however, at the expense of pcms. Sperry was found to be doing quite well with its personal computers, with 57% of its respondents having standardized on its machines and 20% on IBM's. Among Burroughs sites, the comparable figures are 31% for Burroughs and 35% for IBM.

Boost for Honeywell

As for Honeywell, after two extremely slow years, planned installation activity among its user base has gotten a substantial shot in the arm. While last year these users said they would install equipment that was worth 10% of the value of their installed base during the following two years, they indicated a comparable figure of 17% this year. However, only half the percentage of those users (22% this year compared with 44% last year) said that they planned to add disk drives.

The percentage of Honeywell sites needing more mainframe capacity remained just about flat, at 34%, up from 32% in 1986. A similar situation was found in the need for disk capacity (49% needing it this year, compared to 50% last year). Just over a fifth (23%) of the respondents said they planned to add disk drives, while exactly a third said they planned to add crt terminals.

On the distributed processing front, Honeywell users seem to lead the industry: 43% of them are currently involved with that technology, while 58% will be so by the end of next year. However, a relatively tiny fraction of the Honeywell base (7%) said it had standardized on Honeywell personal computers. This compares poorly with, for instance, Sperry's figure of 57%, and represents a vulnerability to other vendors, namely

IBM. Similarly, only a third or so of the Honeywell sites said they had chosen that firm as the main supplier of office systems.

Nevertheless, there was a general improvement in Honeywell respondents' attitude toward the vendor, with the strongest negative factor continuing to be applications software. The company has gained substantial favor for its field maintenance services, however.

NCR user respondents indicated an overall improvement in their attitude toward the vendor, but showed continuing weak marks for the company's database and applications software offerings. As a whole, planned installation activity was up substantially compared with the year before. NCR customers said that during 1987-88 they would add equipment worth 21% of the value of their current installed base; last year's figure was only 13%. In terms of units, those planned installations would be equivalent to 17% of the installed base, down slightly from the 16% registered last year.

In terms of already installed capacity for 1987-88, a quarter of the NCR sites said they needed more mainframe capacity. NCR's important financial institution customers showed the least need for system capacity. Business services, manufacturing, and wholesale/retail services also have more than enough capacity on hand. A third of the NCR sites said they needed to—and would—add disk drive capacity; the strongest demand came from users of large V8XXX mainframes. A third of all NCR respondents indicated plans to add crt terminals.

But users of the small V8XXX machines showed a strong leaning toward leaving the NCR fold sometime in the future: one out of four such users said they would do so, up from one out of 10 a year ago.

An important product line for NCR has been its Tower systems, based on the 32-bit Motorola 68000 microprocessor. Thirty percent of the large V8XXX respondents already have installed such machines, with another 10% planning to do so. While only 19% of the large NCR sites were currently involved with distributed processing, 43% said they would be by the end of next year.

Each year this survey measures customer loyalties, and this year's poll found sharp increases in the portion of large-scale (i.e., the most important) Honeywell and NCR users who are "seriously considering a change" of primary vendor. Last year, only 20% of such Honeywell sites and 4% of NCR sites fit into that category, but this year the comparable figures are 31% and 13%. Burroughs and Sperry users came in this year at 15% and 17%, respectively up slightly from 14% each last year.

Survey Method

The 1987 DATAMATION/Cowen & Co. Computer and Telecommunications Survey, the 10th to be conducted by the two organizations, began Jan. 12 when some 55,000 questionnaires were mailed to mainframe users across the U.S. and Canada. As in previous years, both general and vendor-specific questions were asked in an attempt to gauge users' attitudes toward their vendors and to project user spending plans.

By late February, a total of 3,919 qualified, unduplicated responses were in hand and ready for tallying. Of those, 2,800 were from IBM sites, 438 from Burroughs sites, 221 from Honeywell sites, 221 from NCR sites, and 239 from Sperry sites. The respondents come from all sectors of the economy: manufacturing, wholesale/retail, banking, insurance, business services, education, government, and others. Annual revenues or budgets for the sites range from under $25 million to over $500 million.

After IBM unveiled its 3090 Model E mainframes in late January, a second questionnaire was sent to almost 500 relevant sites to determine what their reaction to the new machines was. Some 320 responses were received and tallied.

In analyzing the survey data—of which only a small fraction is portrayed in this article—one should keep in mind that they reflect the economic environment at a fixed point in time. Thus, the survey cannot anticipate the effects of subsequent products or pricing changes.

To order the complete survey results, please call Laurie Schnepf at (212) 605-9726.

Digital World Seen as Attractive

As usual, most of those potentially migrating large users (59%) indicated the IBM 370 world as their most likely option, but Digital, at 22%, was mentioned as a strong candidate too. Among small systems sites that might make such a move, Digital scored even higher (28%), compared with IBM's 44%. Hewlett-Packard's score in this respect continued to shrink, down to 8% of small users this year from 11% in 1985.

Price/performance remains the key issue for those non-IBM sites that are seriously considering a switch of vendors, which means that to remain competitive, the BUNCH suppliers must keep up with each other and IBM. Of those likely to switch vendors, 58% said their current vendors' systems offered "inferior" price/performance; 27% ranked their vendor as average.

For the non-IBM sites as a whole, the availability of applications software is again the most cited area needing vendor attention. Third-party vendors may be coming to the rescue, however, for in all categories except Honeywell, fewer users this year than last ranked outside-supplied applications packages as being "below average."

Turning to communications, the survey found that non-IBM sites are planning further connections into networks based on IBM's de facto standard Systems Network Architecture. Among large Sperry, Burroughs, Honeywell, and NCR sites, respectively, 6%, 1%, 9%, and 1% said they were already using SNA connections. But current plans call for those figures to grow to 9%, 9%, 17%, and 14%, respectively, in the following two years. Proprietary network architectures were in use or planned at 30%, 32%, 41%, and 4% of those same large sites.

However one defines it, distributed processing gains importance each year. This year's poll projects an 18% compound growth rate for that type of computing, with 39% of the sites involved at the time of the survey and a total of 54% planning to be so by the end of next year. There appears to be an interesting shift away from personal computers in departmental computing and toward minicomputers. Of the planned departmental systems cited by IBM sites, 39.6% were to use pcs (down from 45.6% of those already installed), while a less-than-overwhelming 17.4% were to use the new 9370 midrange processor. System/3X machines were to hold steady at about 36%. ■

Companies are simply not meeting the computer training needs of their end-user employees, a recent survey shows. Self-training was found to be the dominant mode of learning among 100 users surveyed at 20 large and medium-sized companies. Top management needs to become more aware of just how important organizational learning is to the successful development of a corporation. Training budgets that represent 1% to 2% of the information systems budget are too small to support yesterday's educational needs, let alone today's.

Training Today's User

BY R. RYAN NELSON
AND PAUL H. CHENEY

In today's corporation, training is not a trendy topic. Often, it's not a topic at all. Disavowing any formal role in the educational process, many companies have left dp training of the operational staff up to the individual end user.

A recent survey of 100 users in 20 large and medium-sized corporations shows that companies simply are not meeting the computer training needs of their end-user employees. In many of these firms, technology, not training in technology, gets the highest priority.

Why is this so? The manager of information support at Durham Life Insurance Co., Durham, N.C., candidly explains, "It is purely a financial reason.... When you buy a piece of hardware, you capitalize it and depreciate it over a five-year period. In other words, the philosophy is that hardware is free. Furthermore, hardware is not going to get sick, strike, or quit."

TRAINING IS OFTEN LEFT UP TO THE END USER.

The quitting scenario is one that really scares some companies that shy away from training. "We've just purchased a $2 million computer and that decision was made in a one-hour meeting," says Durham Life's dp boss. "On the other hand, I've been through three separate hour-long meetings over whether or not we were going to spend several thousand dollars training somebody in a leading-edge technology only to lose him to some other company."

The first step in meeting a company's end-user training needs is to determine those needs. This can be accomplished by questioning the employees themselves. They know their own dp skill levels and the type of reports they have to furnish. One way to find out those skill levels is through diagnostic tools such as a questionnaire that rates employees' computer-related abilities.

To see how this works in practice, a questionnaire was administered to the 100 users surveyed. The objectives were to determine individual abilities and to see how important each person felt the different dp skills were to his or her job performance. These users reported they had the most ability in understanding and interpreting output, accessing data, and using hardware; their skills were lacking in programming, model building, and the ability to use graphics techniques. Deficiencies in the model-building area can have a negative impact on the development of decision support applications.

Items from this basic-abilities questionnaire can be modified or deleted as new dp skills or technologies become integrated into the organization. After administering the questionnaire on a periodic basis, organizations should take steps to remedy the shortfall in skills. A seminar on modeling techniques, for example, would be appropriate for most of the 100 survey participants.

Using Outside Reviewers

There are other approaches that can help an organization assess its dp training needs. One company recommended bringing in outside consultants to review the performance of the information systems area, including computer-related training programs. Another firm reported that at its annual meeting, operating managers are asked to pin-

point the troubles they've had with service departments, including dp. During this brainstorming session, managers identify their problems and then state their solutions.

Most companies never seem to get to this needs assessment stage. Generally speaking, top management needs to become more aware of just how important organizational learning is to the successful development of a corporation. Resources need to be devoted to R&D activities aimed not only at the corporate product or service, but also at the corporate employee. Training budgets that represent 1% to 2% of the information systems budget are too small to support yesterday's needs, let alone today's.

The end users surveyed were also asked about the sources of their computer-related training. Self-training was found to be the dominant source of training. Many of the managers described the amount of their computer education as only slight to moderate. More specifically, 80% said they had received none, slight, or moderate training in the five categories listed.

Certain types of training turned out to be useful in building particular computer abilities. College training tended to be most valuable in developing an employee's ability to program, model, and use graphics facilities, and for learning specific applications development packages such as Lotus 1-2-3 and dBase III.

Not surprisingly, vendor training proved especially helpful in educating managers in the use of specific applications software packages and in the other, more proprietary realms of data communications and hardware concepts. Meanwhile, self-training enhanced most of the skill areas, including use of packaged software, data communications, graphics capabilities, and databases.

Training Increases Abilities

A total of seven different training techniques were used among the 20 companies surveyed. They included tutorials; courses, lectures, or seminars; program instruction/computer-assisted instruction; interactive training manuals; resident experts; help components embedded in end-user information systems; and education conducted outside the company, such as college courses.

The managerial end users rated each technique in terms of quantity and quality. The average amount of training time received by each user since beginning his or her employment at the firm ranged from 7.82 hours for the interactive training manual method to 104.82 hours for the resident expert approach. Of the 100 managers, 74 did not have any experience with help components.

The survey indicated that training increased the computer abilities of managers as well as their direct use of dp systems in their organizations. Users were more satisfied using technology tools when they were adequately trained.

The tutorial technique was the most effective in terms of educating end users about packaged applications software. Programmed instruction and computer-assisted instruction were better for teaching office automation skills.

Most of the companies surveyed were not meeting the computer training requirements of their employees, who ended up teaching themselves the dp skills they needed. To put training on the right track, corporations need to invest more in their computer education programs. One to two trainers for a firm with over 100,000 employees is simply not enough.

It may be necessary to bring in training specialists from the vendor or consulting community to assist in these educational efforts. Self-training is all right as long as it is adequately supported by in-house experts, help components, programmed or computer-assisted instruction modules, tutorials, and in some cases, an interactive training manual.

Companies also should have better communication with colleges and universities, keeping them up-to-date on the computer-related skill requirements they desire for both their technical and nontechnical employees. Industry advisory boards can often serve as useful go-betweens in this process. Even more important is internal communication. Organizations should look for every possible opportunity to bring the information system staff together with operating personnel to exchange information and increase understanding. ■

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FIGURE 1 Rating and Ranking Computer Abilities

ABILITY TO:	PERCEIVED IMPORTANCE RANK	PERCEIVED IMPORTANCE MEAN RATING*	CURRENT ABILITY LEVEL RANK	CURRENT ABILITY LEVEL MEAN RATING*
Understand/interpret output	1	3.86	1	4.41
Access data	2	3.00	2	3.46
Use hardware	3	2.79	3	3.30
Use packaged application software	4	2.63	4	3.20
Use application development software	6	2.14	5	3.10
Use operating systems	5	2.40	6	2.58
Handle data communications	8	2.03	7	2.48
Use graphics techniques	11	1.95	8	2.45
Use office automation systems	7	2.06	9	2.40
Build models	10	1.96	10	2.34
Program	9	1.97	11	2.12

*1 = low, 5 = high

FIGURE 2 Sources of Computer Training

(FREQUENCY/PERCENT)

TRAINING SOURCE	NONE	SLIGHT	MODERATE	SUBSTANTIAL	GREAT	VERY GREAT	MEAN*
Self	8	31	17	15	20	9	3.35
College	37	26	27	5	5	0	2.15
Company	25	32	15	14	9	5	2.65
Vendor	43	24	19	7	5	2	2.13
Other	85	5	8	1	1	0	1.28

*1 = low, 5 = high